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FLOOD INSURANCE STUDY

MADISON COUNTY, KENTUCKY

UNINCORPORATED AREAS

SEPTEMBER 28, 1990

Federal Emergency Management Agency

COMMUNITY NUMBER 210342

NOTICE TO
FLOOD INSURANCE STUDY USERS

Communities participating in the National Flood Insurance Program have established repositories of flood hazard data for floodplain management and flood insurance purposes. This Flood Insurance Study may not contain all data available within the repository. It is advisable to contact the community repository for any additional data.

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FLOOD INSURANCE STUDY

MADISON COUNTY,
UNINCORPORATED AREAS,
KENTUCKY

1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study investigates the existence and severity of flood hazards in the Unincorporated Areas of Madison County, Kentucky, and aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. This study has developed flood risk data for various areas of the community that will be used to establish actuarial flood insurance rates and assist the community in its efforts to promote sound floodplain management. Minimum floodplain management requirements for participation in the National Flood Insurance Program are set forth in the Code of Federal Regulations at 44 CFR, 60.3.

In some states or communities, floodplain management criteria or regulations may exist that are more restrictive or comprehensive than the minimum Federal requirements. In such cases, the more restrictive criteria take precedence and the State (or other jurisdictional agency) will be able to explain them.

1.2 Authority and Acknowledgments

The sources of authority for this Flood Insurance Study are the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

The hydrologic and hydraulic analyses for this study were performed by GRW Engineers, Inc. (the Study Contractor) for the Federal Emergency Management Agency (FEMA), under Contract No. EMW-87-C-2455. This study was completed in September 1988.

The hydrologic and hydraulic analysis for the Kentucky River was obtained from the Flood Insurance Study for Jessamine County, Kentucky (Reference 1).

1.3 Coordination

On October 22, 1986 an initial coordination meeting was held with representatives of FEMA, Madison County, and the Study Contractor. Coordination with town officials and Federal, State, and regional agencies produced a variety of information pertaining to flood plain regulations, available community maps, flood history, and other hydrologic data.

The U.S. Geological Survey (USGS), Kentucky Division of Water, U.S. Soil Conservation Service, and U.S. Army Corps of Engineers (COE), Louisville District were contacted for data concerning flood discharges and elevations. Vertical control data used to establish the network of elevation reference marks were provided by the USGS.

On November 14, 1989, the results of this Flood Insurance Study were reviewed and accepted at a final coordination meeting attended by representatives of the Study Contractor, FEMA, and the community.

2.0 AREA STUDIED

2.1 Scope of Study

This Flood Insurance Study covers the unincorporated areas of Madison County, Kentucky. The area of study is shown on the Vicinity Map (Figure 1). The incorporated areas within the county were excluded from this study.

Flooding caused by overflow of the Kentucky River and Tate Creek was studied in detail.

Areas having low development potential or minimal flood hazards were previously studied using approximate analyses. The results were shown on the Flood Hazard Boundary Map for the Unincorporated Areas of Madison County, Kentucky (Reference 2) and are incorporated into this Flood Insurance Study.

The areas studied were selected with priority given to all known flood hazard areas and areas of projected development or proposed construction through September 1993. The scope and methods of study were proposed to and agreed upon by FEMA and Madison County.

2.2 Community Description

Madison County is in east-central Kentucky, about 25 miles southeast of Lexington. Madison County is bordered on the north by Fayette and Clark Counties, on the east by Estill County, on the south by Jackson and Rockcastle Counties, and on the west by Garrard and Jessamine Counties. The county is served by U.S. Routes 25, 75, 421, State Routes 169, 1156 and CSX railroad. The 1980 population of Madison County was reported to be 53,352 (Reference 3).

The climate in Madison County is temperate and favorable for many types of plants and animals, with winters that are moderately cold and summers that are warm and humid. Average precipitation of about 48 inches annually is fairly well-distributed throughout the year, with October having the least amount of precipitation and January and July having the most.

Tate Creek is a tributary of the Kentucky River and flows to the northwest. The Kentucky River, a major watershed of central Kentucky, flows generally east to west through Madison County before discharging into the Ohio River some 150 miles downstream of Carrollton in northern Kentucky. The river width between banks is about 350 feet.

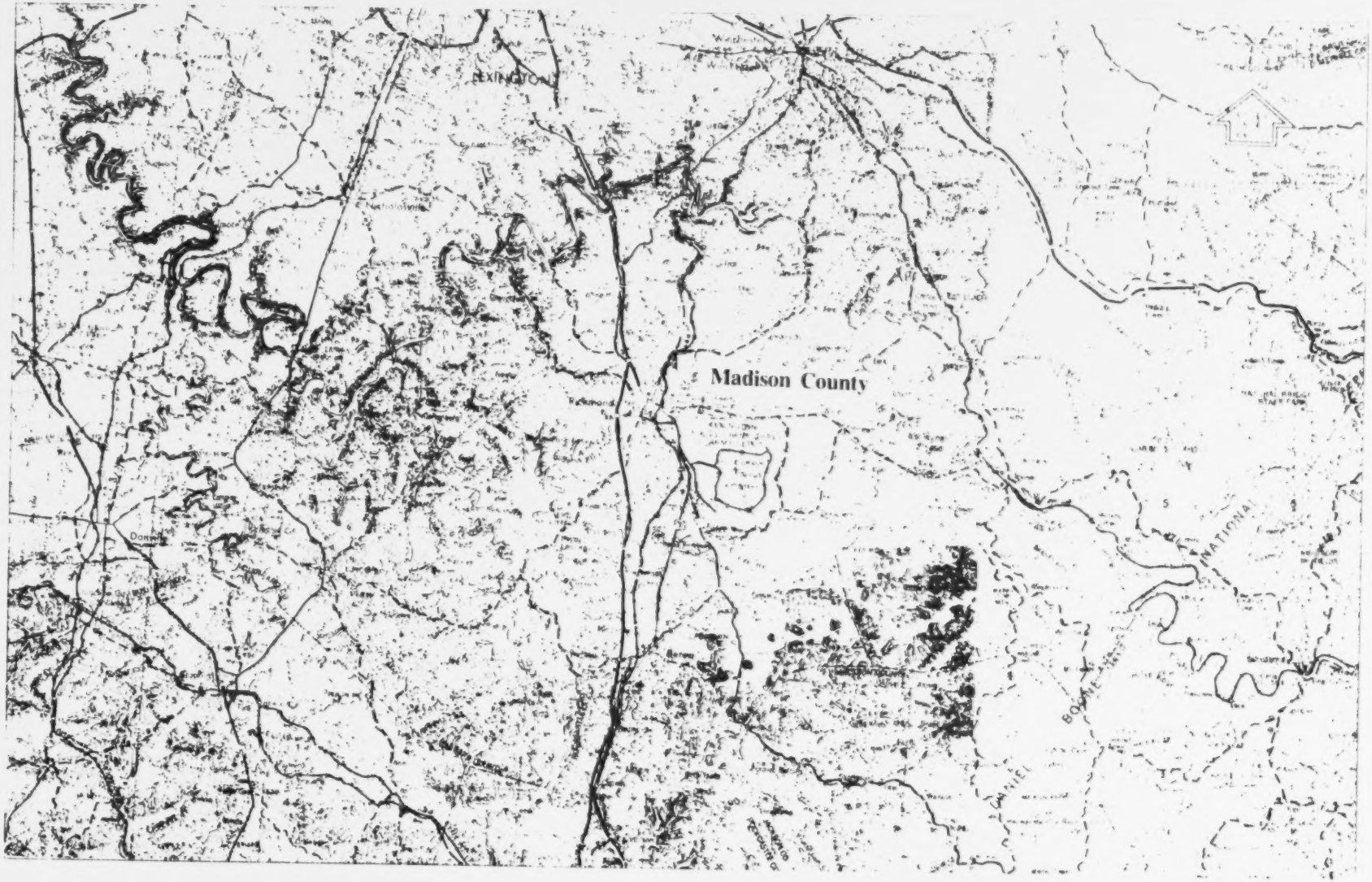


FIGURE 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

MADISON COUNTY, KY
(UNINCORPORATED AREAS)

APPROXIMATE SCALE

7 0 7 14 21 MILES

VICINITY MAP

There is little development within the floodplain limits of Tate Creek and the Kentucky River, except for the unincorporated community of Valley View, which is above the floodplain limits for the most part. Most development is residential and agricultural.

2.3 Principal Flood Problems

Low-lying areas of Madison County flood periodically from the Kentucky River, Tate Creek and other streams.

2.4 Flood Protection Measures

Flood protection measures are not known to exist within the study area.

Lock and Dam No. 9 on the Kentucky River located just downstream of the confluence of Tate Creek is one of a series designed for navigational purposes. The facility does not offer flood protection to Madison County from the 100-year flood.

3.0 ENGINEERING METHODS

For the flooding sources studied in detail in the community, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. Flood events of a magnitude that is expected to be equaled or exceeded once on the average during any 10-, 50-, 100-, or 500-year period (recurrence interval) have been selected as having special significance for floodplain management and for flood insurance rates. These events, commonly termed the 10-, 50-, 100-, and 500-year floods, have a 10-, 2-, 1-, and 0.2-percent chance, respectively, of being equaled or exceeded during any year. Although the recurrence interval represents the long-term average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than 1 year are considered. For example, the risk of having a flood that equals or exceeds the 100-year flood (1-percent chance of annual exceedence) in any 50-year period is approximately 40-percent (4 in 10), and, for any 90-year period, the risk increases to approximately 60-percent (6 in 10). The analyses reported herein reflect flooding potentials based on conditions existing in the community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish the peak discharge-frequency relationships for each riverine flooding source studied in detail affecting the community.

The discharges for the 10-, 50-, and 100-year floods on Tate Creek were determined by USGS methods designed for ungaged streams (Reference 4). From these three values a 500-year discharge was calculated through a regression analysis of the discharge versus log-of-return-interval relationship.

Discharges for the Kentucky River were taken from the Flood Insurance Study for Jessamine County (Reference 1). These discharges were determined by frequency curves utilizing gage data from USGS at Lock No. 8 and Lock No. 10 on the Kentucky River. This method, the utilization of historical flooding and annual discharges, is unlike that used for Tate Creek due to the unavailability of historical discharge data on Tate Creek.

Peak discharge-drainage area relationships for the 10-, 50-, 100-, and 500-year floods of each flooding source studied in detail in the community are shown in Table 1.

TABLE 1 - SUMMARY OF DISCHARGES

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (SQ MILES)	PEAK DISCHARGE (CFS)			
		10-YEAR	50-YEAR	100-YEAR	500-YEAR
TATE CREEK					
at mouth	36.4	4,082	5,955	6,789	8,625
KENTUCKY RIVER					
at Lock and Dam No. 8	4,414	87,200	103,300	109,200	120,500
at Lock and Dam No. 9	4,102	81,200	94,300	101,800	113,500

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of flooding from the sources studied were carried out to provide estimates of the elevations of floods of the selected recurrence intervals.

Cross sections and bridge sections were all obtained from field surveys. Locations of selected cross sections used in the hydraulic analyses are shown on the Flood Profiles and on the Flood Insurance Rate Map.

Roughness coefficients (Manning's "n") used in hydraulic computations for Tate Creek, were chosen by engineering judgment and based on field observations of the streams and floodplain area. Roughness values for the Tate Creek channel ranged from 0.04 to 0.055 and floodplain values ranged from 0.05 to 0.09. The channel value of 0.043 and the overbank of 0.073 for the Kentucky River was determined so as to reproduce the highwater marks from the April 1972 flood event.

Water-surface elevations of floods of the selected recurrence intervals were computed through the use of HEC-2 step-backwater computer program (Reference 5).

The starting water-surface elevations for the Kentucky River were obtained from stage-discharge curve data provided by the COE. The starting water-surface elevations for Tate Creek were calculated using the slope-area method.

Flood profiles were drawn showing the computed water-surface elevations for floods of the selected recurrence intervals. In cases where the 50- and 100-year flood elevations are close together, due to limitations of the profile scale, only the 100-year profile has been shown.

The hydraulic analyses for this study are based on the effects of unobstructed flow. The flood elevations shown on the profiles are thus considered valid only if hydraulic structures remain unobstructed, operate properly, and do not fail.

All elevations are referenced to the National Geodetic Vertical Datum of 1929 (NGVD). Elevation reference marks used in this study are shown on the map and described in the exhibit labeled Elevation Reference Marks.

4.0 FLOODPLAIN MANAGEMENT APPLICATIONS

The National Flood Insurance Program encourages state and local governments to adopt sound floodplain management programs. Therefore, each Flood Insurance Study provides 100-year flood elevations and delineations of the 100- and 500-year floodplain boundaries and 100-year floodway to assist communities in developing floodplain management measures.

4.1 Floodplain Boundaries

To provide a national standard without regional discrimination, the 1-percent annual chance (100-year) flood has been adopted by FEMA as the base flood for floodplain management purposes. The 0.2-percent annual chance (500-year) flood is employed to indicate additional areas of flood risk in the community. For each stream studied in detail, the 100- and 500-year floodplain boundaries have been delineated using the flood elevations determined at each cross section. Between cross sections, the boundaries were interpolated using topographic maps at a scale of 1:24000 with a contour interval of 20 feet (Reference 6).

The 100-year and 500-year floodplain boundaries are shown on the Flood Insurance Rate Map. On this map, the 100-year floodplain boundary corresponds to the boundary of the areas of special flood hazards (Zones A, AE, AH, AO, A99, V, and VE) and the 500-year floodplain boundary corresponds to the boundary of areas of moderate flood hazards. In cases where the 100- and 500-year floodplain boundaries are close together, only the 100-year floodplain boundary has been shown. Small areas within the floodplain boundaries may lie above the flood elevations but cannot be

shown due to limitations of the map scale and/or lack of detailed topographic data.

For the streams studied by approximate methods, only the 100-year floodplain boundary was delineated using the Flood Hazard Boundary Map for the Unincorporated Areas of Madison County, Kentucky (Reference 2).

4.2 Floodways

Encroachment on floodplains, such as structures and fill, reduces the flood-carrying capacity, increases the flood heights and velocities, and increases flood hazards in areas beyond the encroachment itself. One aspect of floodplain management involves balancing the economic gain from floodplain development against the resulting increase in flood hazard. For purposes of the National Flood Insurance Program, a floodway is used as a tool to assist local communities in this aspect of floodplain management. Under this concept, the area of the 100-year floodplain is divided into a floodway and a floodway fringe. The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 100-year flood can be carried without substantial increases in flood heights. Minimum Federal standards limit such increases to 1.0 foot, provided that hazardous velocities are not produced. The floodways in this study are presented to local agencies as minimum standards that can be adopted directly or that can be used as a basis for additional floodway studies.

The floodways for this study were computed for certain stream segments on the basis of equal conveyance reduction from each side of the floodplain. Floodway widths were computed at cross sections. Between cross sections, the floodway boundaries were interpolated. The results of the floodway computations are tabulated for selected cross sections and are shown in Table 2, Floodway Data. The computed floodways are shown on the Flood Insurance Rate Map. In cases where the floodway and 100-year floodplain boundaries are either close together or collinear, only the floodway boundary is shown.

Along streams where floodways have not been computed, the community must ensure that the cumulative effect of development in the floodplain will not cause more than 1.0-foot increase in the base flood elevations at any point within the community.

The area between the floodway and the 100-year floodplain boundaries is termed the floodway fringe. The floodway fringe encompasses the portion of the floodplain that could be completely obstructed without increasing the water-surface elevation of the 100-year flood by more than 1.0 foot at any point. Typical relationships between the floodway and the floodway fringe and their significance to floodplain development are shown in Figure 2.

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (FEET NGVD)	WITHOUT FLOODWAY (FEET NGVD)	WITH FLOODWAY (FEET NGVD)	INCREASE (FEET)
KENTUCKY RIVER								
A	147.7	489[3]	19,611	5.4	573.1	573.1	574.1	1.0
B	149.4	682[3]	21,545	4.9	574.6	574.6	575.6	1.0
C	150.7	367[3]	18,707	5.5	575.6	575.6	576.6	1.0
D	153.0	483[3]	21,536	4.8	577.2	577.2	578.2	1.0
E	155.9	453[3]	19,660	5.2	579.2	579.2	580.2	1.0
F	157.2	528[3]	22,004	4.6	580.3	580.3	581.3	1.0
TATE CREEK								
A	3058[2]	219	1469	4.6	581.0	561.5[4]	562.0	0.5
B	3793[2]	139	1143	5.9	581.0	562.5[4]	563.2	0.7
C	6532[2]	134	892	7.6	581.0	568.0[4]	568.3	0.3
D	7604[2]	410	1605	4.2	581.0	571.8[4]	572.3	0.5
E	8660[2]	102	652	10.4	581.0	576.3[4]	576.4	0.1
F	9062[2]	104	1111	6.1	581.0	579.5[4]	580.5	1.0
G	10,271[2]	90	703	9.7	583.8	583.8	584.4	0.6
H	11,591[2]	95	845	8.0	593.8	593.8	594.4	0.6
I	12,806[2]	134	1064	6.4	599.0	599.0	599.8	0.8
J	14,126[2]	104	788	8.6	605.4	605.4	606.3	0.9
K	16,132[2]	134	963	7.0	618.6	618.6	619.3	0.7

[1]MILES ABOVE MOUTH
[2]FEET ABOVE MOUTH
[3]THIS WIDTH EXTENDS BEYOND COUNTY BOUNDARY
[4]ELEVATIONS WITHOUT CONSIDERING BACKWATER EFFECT FROM KENTUCKY RIVER

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

MADISON COUNTY, KY
(UNINCORPORATED AREAS)

FLOODWAY DATA

KENTUCKY RIVER—TATE CREEK

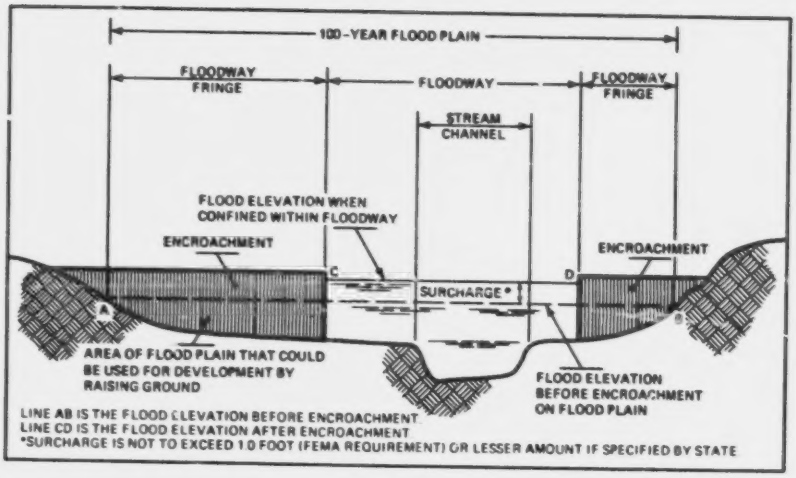

100-YEAR FLOOD PLAIN
FLOODWAY FRINGE
FLOODWAY
FLOODWAY FRINGE
STREAM CHANNEL
FLOOD ELEVATION WHEN CONFINED WITHIN FLOODWAY
ENCROACHMENT
ENCROACHMENT
C
D
SURCHARGE*
A
B
AREA OF FLOOD PLAIN THAT COULD BE USED FOR DEVELOPMENT BY RAISING GROUND
FLOOD ELEVATION BEFORE ENCROACHMENT ON FLOOD PLAIN
LINE AB IS THE FLOOD ELEVATION BEFORE ENCROACHMENT
LINE CD IS THE FLOOD ELEVATION AFTER ENCROACHMENT
*SURCHARGE IS NOT TO EXCEED 1.0 FOOT (FEMA REQUIREMENT) OR LESSER AMOUNT IF SPECIFIED BY STATE

FIGURE 2 - Floodway Schematic

5.0 INSURANCE APPLICATION

For flood insurance rating purposes, flood insurance zone designations are assigned to a community based on the results of the engineering analyses. These zones are as follows:

Zone A

Zone A is the flood insurance rate zone that corresponds to the 100-year floodplains that are determined in the Flood Insurance Study by approximate methods. Because detailed hydraulic analyses are not performed for such areas, no base flood elevations or depths are shown within this zone.

Zone AE

Zone AE is the flood insurance rate zone that corresponds to the 100-year floodplains that are determined in the Flood Insurance Study by detailed methods. Whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone X

Zone X is the flood insurance rate zone that corresponds to areas outside the 100-year floodplain, areas of 100-year flooding where average depths are less than 1 foot, areas of 100-year flooding where the contributing drainage area is less than 1 square mile, and areas protected from the 100-year flood by levees. No base flood elevations or depths are shown within this zone.

6.0 FLOOD INSURANCE RATE MAP

The Flood Insurance Rate Map is designed for flood insurance and floodplain management applications.

For flood insurance applications, the map designates flood insurance rate zones as described in Section 5.0 and, in the 100-year floodplains that were studied by detailed methods, shows selected whole-foot base flood elevations or average depths. Insurance agents use the zones and base flood elevations in conjunction with information on structures and their contents to assign premium rates for flood insurance policies.

For floodplain management applications, the map shows by tints, screens, and symbols the 100- and 500-year floodplains, the floodways, and the locations of selected cross sections used in the hydraulic analyses and floodway computations.

7.0 OTHER STUDIES

The Flood Insurance Studies published for Jessamine and Clark Counties and the City of Berea, Kentucky (References 1, 7 and 8) and the Flood Insurance Rate Maps printed for the City of Richmond, Jackson and Garrard Counties, Kentucky (References 9-11) are in agreement with this study.

This Flood Insurance Study supersedes the previously printed Flood Hazard Boundary Map for Madison County, Kentucky (Reference 2).

8.0 LOCATION OF DATA

Information concerning the pertinent data used in the preparation of this study can be obtained by contacting the Natural and Technological Hazards Division, FEMA, 1371 Peachtree Street, NE., Suite 736, Atlanta, Georgia 30309.

Future revisions may be made that do not result in the republishing of the Flood Insurance Study report. To assure that any user is aware of all revisions, it is advisable to contact the map repository of flood hazard data located in the community.

9.0 REFERENCES AND BIBLIOGRAPHY

1. U.S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Insurance Study, Jessamine County, Unincorporated Areas, Kentucky, August 1978.

2. U.S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Hazard Boundary Map, Madison County, Unincorporated Areas, Kentucky, August 1977.

3. U.S. Department of Commerce, Bureau of the Census, 1980 Census of Population, Number of Inhabitants, Kentucky, Washington, D.C., February 1982.

4. U.S. Department of the Interior, U.S. Geological Survey, Water-Resources Investigations 76-62, Techniques for Estimating Magnitude and Frequency of Floods in Kentucky.

5. U.S. Army Corps of Engineers, Hydrologic Engineering Center, HEC-2 Water Surface Profiles, Computer Program 723-X6-L202A, Davis, California, April 1984.

6. U.S. Geological Survey, 7.5 Minute Series Topographic Maps, Scale 1:24000, Contour Interval 20 Feet: Valley View, Kentucky, 1952.

7. Federal Emergency Management Agency, Flood Insurance Study, Clark County, Unincorporated Areas, Kentucky, December 1986.

8. ----------, Flood Insurance Study, City of Berea, Madison County, Kentucky, September 1988.

9. ----------, Flood Insurance Rate Map, City of Richmond, Madison County, Kentucky, September 1985.

10. ----------, Flood Insurance Rate Map, Jackson County, Unincorporated Areas, Kentucky, July 1987.

11. ----------, Flood Insurance Rate Map, Garrard County, Unincorporated Areas, Kentucky, September 1989.

ELEVATION REFERENCE MARKS

REFERENCE MARK	FLOOD INSURANCE RATE MAP PANEL	ELEVATION (FEET NGVD)	DESCRIPTION OF LOCATION
1	0025	626.08	railroad spike in power pole on west side of State Route 169 located about 1.2 miles south of State Route 169 bridge over Tate Creek
2	0025	614.85	railroad spike in power pole located on west side of State Route 169, about 3,300 feet south of State Route 169 bridge over Tate Creek
3	0025	582.08	railroad spike in power pole located on south west side of State Route 169 bridge over Tate Creek
4	0025	589.20	railroad spike in power pole located on the northeast side of State Route 169, about 2,400 feet southeast from intersection of State Route 1156 and State Route 169
5	0025	581.24	railroad spike at center of intersection of State Route 1156 and State Route 169
6	0025	562.61	chiseled square on southeast corner of Tattler's Branch Road bridge over Tate Creek, about 0.2 foot northwest of brace pole for cable handrail
7	0025	568.21	hub and tack located on the east bank of the Kentucky River approximately 200 feet upstream from the mouth of Tate Creek
8	0025	568.183	U.S. Coast & Geodetic Survey standard tablet set in concrete post located about 200 feet east of intersection of State Route 169 and Tattler's Branch Road

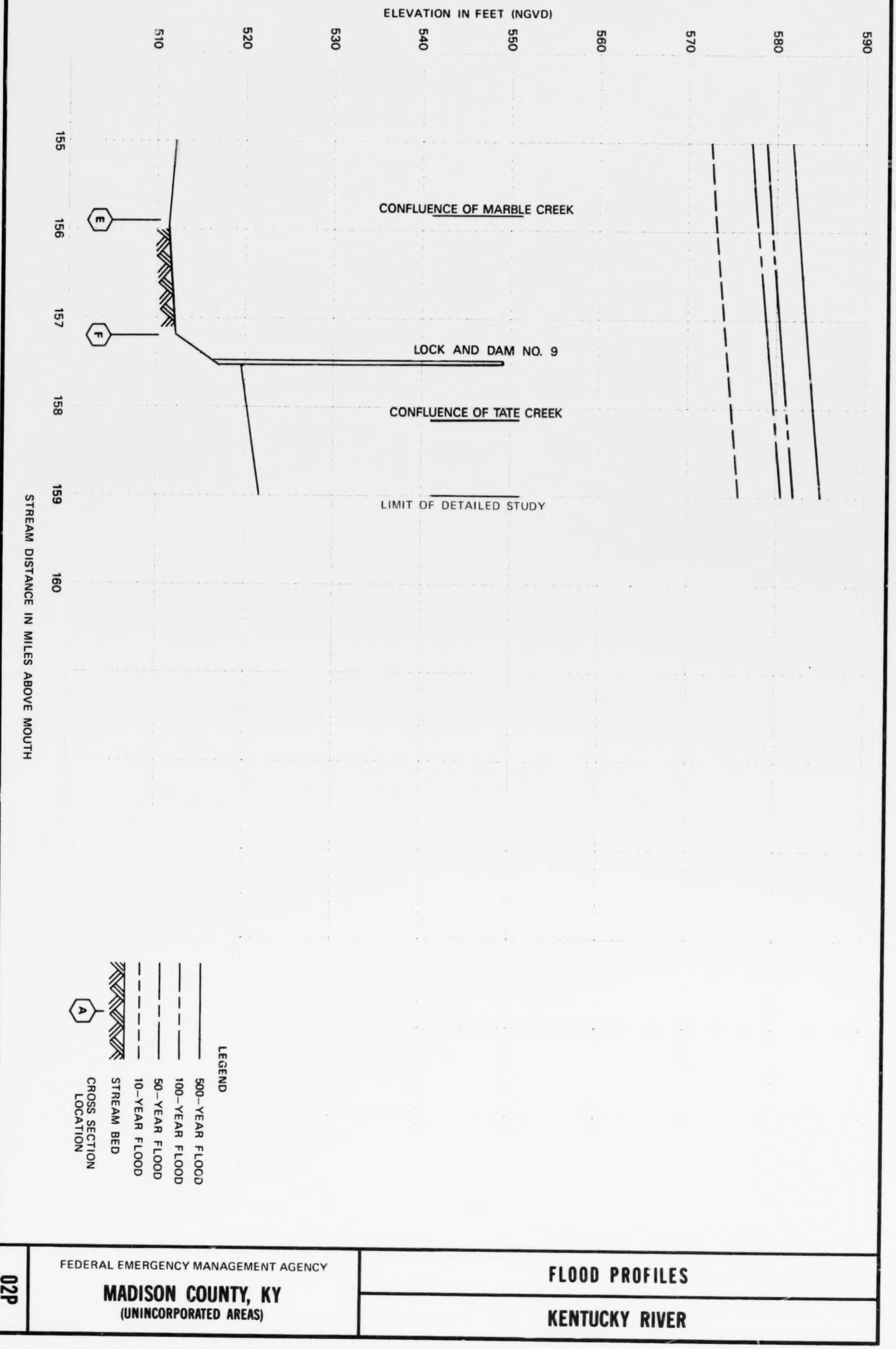
FLOOD PROFILES

KENTUCKY RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

MADISON COUNTY, KY
(UNINCORPORATED AREAS)

01P



02P

FEDERAL EMERGENCY MANAGEMENT AGENCY

MADISON COUNTY, KY
(UNINCORPORATED AREAS)

FLOOD PROFILES

KENTUCKY RIVER

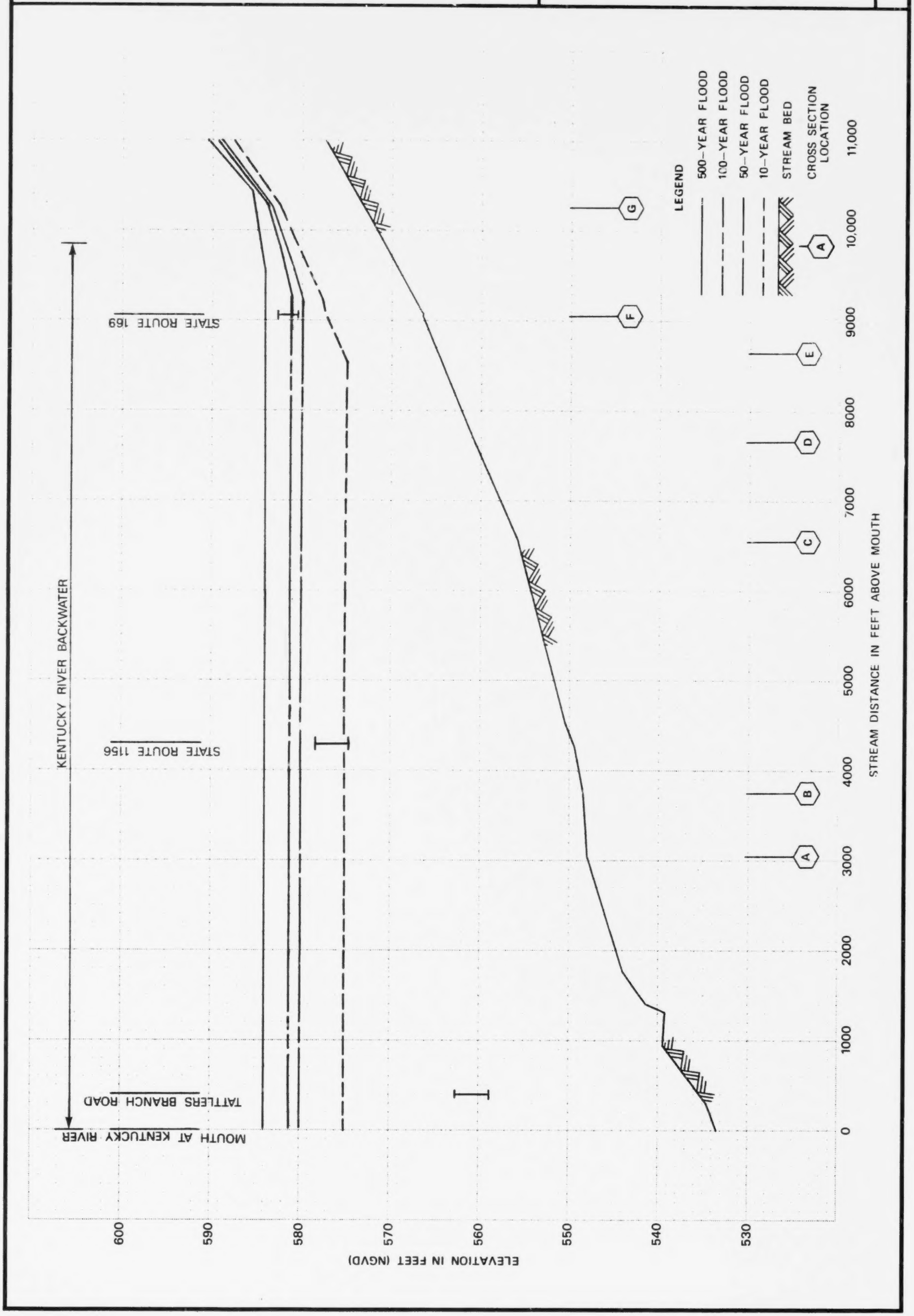
FEDERAL EMERGENCY MANAGEMENT AGENCY

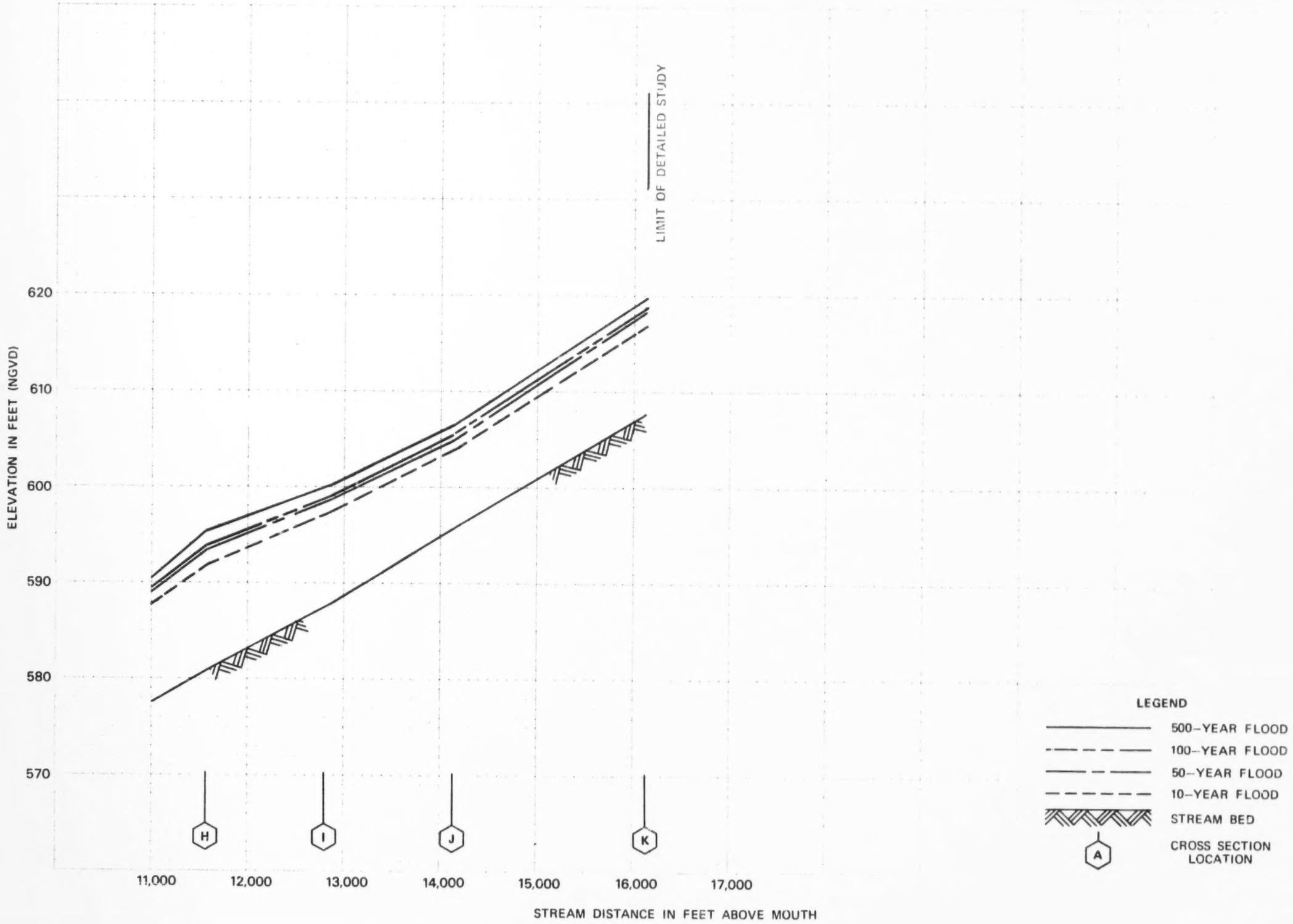
MADISON COUNTY, KY
(UNINCORPORATED AREAS)

03P

FLOOD PROFILES

TATE CREEK





FLOOD PROFILES

TATE CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

MADISON COUNTY, KY
(UNINCORPORATED AREAS)

04P